Dataset: Cellular elemental content of individual phytoplankton cells collected during US GEOTRACES North Atlantic Transect cruises in the Subtropical western and eastern North Atlantic Ocean during Oct and Nov, 2010 and Nov. 2011.

Project(s): U.S. GEOTRACES North Atlantic Transect (U.S. GEOTRACES NAT)

Abstract: Phytoplankton contribute significantly to global C cycling and serve as the base of ocean food webs. Phytoplankton require trace metals for growth and also mediate the vertical distributions of many metals in the ocean. This dataset provides direct measurements of metal quotas in phytoplankton from across the North Atlantic Ocean, known to be subjected to aeolian Saharan inputs and anthropogenic inputs from North America and Europe. Bulk particulate material and individual phytoplankton cells were collected from the upper water column (<150 m) as part of the US GEOTRACES North Atlantic Zonal Transect cruises (KN199-4, KN199-5, KN204-1A,B). The cruise tracks spanned several ocean biomes and geochemical regions. Chemical leaches (to extract biogenic and otherwise labile particulate phases) are combined together with synchrotron X-ray fluorescence (SXRF) analyses of individual micro and nanophytoplankton to discern spatial trends across the basin. Individual phytoplankton cells were analyzed for elemental content using SXRF (Synchrotron radiation X-Ray Fluorescence). Carbon was calculated from biovolume using the relationships of Menden-Deuer & Lessard (2000). For a complete list of measurements, refer to the supplemental document 'Field_names.pdf', and a full dataset description is included in the supplemental file 'Dataset_description.pdf'.

Deployment Information

Deployment description for R/V Knorr KN199-04

KN199-04 is the US GEOTRACES Zonal North Atlantic Survey Section cruise planned for late Fall 2010 from Lisboa, Portugal to Woods Hole, MA, USA. 4 November 2010 update: Due to engine failure, the scheduled science activities were canceled on 2 November 2010. On 4 November the R/V KNORR put in at Porto Grande, Cape Verde and is scheduled to depart November 8, under the direction of Acting Chief Scientist Oliver Wurl of Old Dominion University. The objective of this leg is to carry the vessel in transit to Charleston, SC while conducting science activities modified from the original plan. Planned scientific activities and operations area during this transit will be as follows: the ship's track will cross from the highly productive region off West Africa into the oligotrophic central subtropical gyre waters, then across the western boundary current (Gulf Stream), and into the productive coastal waters of North America. During this transit, underway surface sampling will be done using the towed fish for trace metals, nanomolar nutrients, and arsenic speciation. In addition, a port-side high volume pumping system will be used to acquire samples for radium isotopes. Finally, routine

aerosol and rain sampling will be done for trace elements. This section will provide important information regarding atmospheric deposition, surface transport, and transformations of many trace elements. The vessel is scheduled to arrive at the port of Charleston, SC, on 26 November 2010. The original cruise was intended to be 55 days duration with arrival in Norfolk, VA on 5 December 2010. funding: NSF OCE award 0926423 Science Objectives are to obtain state of the art trace metal and isotope measurements on a suite of samples taken on a mid-latitude zonal transect of the North Atlantic. In particular sampling will target the oxygen minimum zone extending off the west African coast near Mauritania, the TAG hydrothermal field, and the western boundary current system along Line W. In addition, the major biogeochemical provinces of the subtropical North Atlantic will be characterized. For additional information, please refer to the GEOTRACES program Web site (GEOTRACES.org) for overall program objectives and a summary of properties to be measured. Science Activities include seawater sampling via GoFLO and Niskin carousels, in situ pumping (and filtration), CTDO2 and transmissometer sensors, underway pumped sampling of surface waters, and collection of aerosols and rain. Hydrography, CTD and nutrient measurements will be supported by the Ocean Data Facility (J. Swift) at Scripps Institution of Oceanography and funded through NSF Facilities. They will be providing an additional CTD rosette system along with nephelometer and LADCP. A trace metal clean Go-Flo Rosette and winch will be provided by the group at Old Dominion University (G. Cutter) along with a towed underway pumping system. List of cruise participants: [PDF] Cruise track: JPEG image (from Woods Hole Oceanographic Institution, vessel operator) Additional information may still be available from the vessel operator: WHOI cruise planning synopsis Cruise information and original data are available from the NSF R2R data catalog. ADCP data are available from the Currents ADCP group at the University of Hawaii: KN199-04 ADCP

Deployment description for R/V Knorr KN199-05

KN199-05 is the completion of the US GEOTRACES Zonal North Atlantic Survey Section cruise originally planned for late Fall 2010 from Lisboa, Portugal to Woods Hole, MA, USA. 4 November 2010 update: Due to engine failure, the science activities scehduled for the KN199-04 cruise were canceled on 2 November 2010. On 4 November the R/V KNORR put in at Porto Grande, Cape Verde (ending KN199 leg 4) and is scheduled to depart November 8, under the direction of Acting Chief Scientist Oliver Wurl of Old Dominion University.Â The objective of KN199 leg 5 (KN199-05) is to carry the vessel in transit to Charleston, SC while conducting abbreviated science activities originally planned for KN199-04. The vessel is scheduled to arrive at the port of Charleston, SC, on 26 November 2010. The original cruise was intended to be 55 days duration with arrival in Norfolk, VA on 5 December 2010. Planned scientific activities and operations area during the KN199 leg 5 (KN199-05) transit will be as follows: the ship's track will cross from the highly productive region off West Africa into the oligotrophic

central subtropical gyre waters, then across the western boundary current (Gulf Stream), and into the productive coastal waters of North America. During this transit, underway surface sampling will be done using the towed fish for trace metals, nanomolar nutrients, and arsenic speciation. In addition, a port-side high volume pumping system will be used to acquire samples for radium isotopes. Finally, routine aerosol and rain sampling will be done for trace elements. This section will provide important information regarding atmospheric deposition, surface transport, and transformations of many trace elements. Science Objectives are to obtain state of the art trace metal and isotope measurements on a suite of samples taken on a mid-latitude zonal transect of the North Atlantic. In particular sampling will target the oxygen minimum zone extending off the west African coast near Mauritania, the TAG hydrothermal field, and the western boundary current system along Line W. In addition, the major biogeochemical provinces of the subtropical North Atlantic will be characterized. For additional information, please refer to the GEOTRACES program Web site (GEOTRACES.org) for overall program objectives and a summary of properties to be measured. Science Activities include seawater sampling via GoFLO and Niskin carousels, in situ pumping (and filtration), CTDO2 and transmissometer sensors, underway pumped sampling of surface waters, and collection of aerosols and rain. Hydrography, CTD and nutrient measurements will be supported by the Ocean Data Facility (J. Swift) at Scripps Institution of Oceanography and funded through NSF Facilities. They will be providing an additional CTD rosette system along with nephelometer and LADCP. A trace metal clean Go-Flo Rosette and winch will be provided by the group at Old Dominion University (G. Cutter) along with a towed underway pumping system. List of cruise participants: [PDF] funding: NSF OCE award 0926423 WHOI cruise planning synopsis Cruise information and original data are available from the NSF R2R data catalog. ADCP data are available from the Currents ADCP group at the University of Hawaii: KN199-05 ADCP

Deployment description for R/V Knorr KN204-01

http://data.bco-dmo.org/GEOTRACES/cruises/KN204-01_GEOTRACES_Station_Plan.jpg

---